2.1.1.1.6.1.1 Nonradiological Emissions

Table 2.1-6 presents the carbon dioxide gas emission estimates for the proposed action. Emission estimates are provided for each of the three source categories for each of the four phases of the proposed action. Carbon dioxide constitutes the majority of greenhouse gas emissions. Some methane and nitrous oxide emissions will occur. Chlorofluorocarbon and hydrochlorofluorocarbon greenhouse gas emissions are not expected from the proposed project.

Table 2.1-6. Annual Carbon Dioxide Estimates in Metric Tons/Year * for the Proposed Action

Phase	Facility		Mobile Sources	Electrical Consumption	Total
	Stationary Sources†	Fugitive from Uranium Recovery Process			
Construction	1,439	0	3,990	542	5,970
Operation	1,439	440	1,490	22,097	25,466
Aquifer Restoration	1,439	0	110	6,685	8,234
Decommissioning	1,439	0	1,286	542	3,267
Peak Year‡	1,439	440	6,876	29,865	38,621§

Source: Modified from IML (2013).
*To convert metric tons to short tons, multiple by 1.10231.
†Except for project year one, stationary emission are assumed to be constant over the project lifespan. Therefore the peak year calculation would only need to include the stationary source emission value one time rather than for each phase.
‡Peak year accounts for when all four phases occur simultaneously and represents the highest amount of emissions the proposed action will generate in any one project year.
§This value is for the peak year total which only includes the stationary source emission value of 1,586 once (Note †). This value is not the total of the individual phase totals in the column because each phase totals includes the stationary source emission value.

3.7.2 Air Quality

Temperature and precipitation are two parameters that can be used to characterize climate change. Average U.S. temperatures have increased more than 1.1 °C [2 °F] over the past 50 years and are projected to rise more in the future (GCRP, 2009). From 1993 to 2008, the average temperature in the Great Plains increased by approximately 0.83 °C [1.5 °F] when compared to the 1961 to 1979 baseline (GCRP, 2009). From 2010 to 2029, the average temperature in the Great Plains is projected to increase approximately 1.7 °C [3 °F] relative to the 1961 to 1979 baseline (GCRP, 2009). The proposed Dewey-Burdock site is considered part of the Great Plains in this study. Although the U.S. Global Change Research Program (GCRP) did not incrementally forecast a change in precipitation by decade, it did project a change in spring precipitation from the baseline period (1961 to 1979) to the next century (2080 to 2099). For the region of South Dakota where the proposed Dewey-Burdock ISR Project is located, GCRP forecasts a 10 to 15 percent increase in spring precipitation (GCRP, 2009).

The EPA administrator determined that greenhouse gas (GHG) in the atmosphere may reasonably be anticipated to endanger public health and welfare (74 FR 66496, 2009). As described in the *Federal Register* notice, the primary scientific basis supporting the administrator's endangerment finding were the major assessments by the U.S. Global Climate Research Program, the Intergovernmental Panel on Climate Change, and the National Research Council. The *Federal Register* notice also states that these assessments indicate that ambient concentrations of GHG emissions do not cause direct adverse health effects (e.g., respiratory or toxic effects), but rather cause indirect effects from the associated changes

in climate. Based on EPA's determination, NRC recognizes that GHGs may contribute to climate change and that climate change may have an effect on health and the environment. GHGs, which can trap heat in the atmosphere, are produced by numerous activities, including the burning of fossil fuels and agricultural and industrial processes. GHGs include carbon dioxide, methane, nitrous oxide, and certain fluorinated gases. These gases vary in their ability to trap heat and in their atmospheric longevity. GHG emission levels are expressed as CO_2 equivalents (CO_2e), which is an aggregate measure of total GHG global warming potential described in terms of CO_2 and accounts for the heat-trapping capacity of different gases. The Center for Climate Strategies estimated that GHG-producing activities in South Dakota accounted for approximately 36.5 million metric tons [40.2 short tons] of gross CO_2e emissions in 2005; levels of 39.1 and 46.6 million metric tons [43.1 and 51.4 short tons] are forecasted for years 2010 and 2020, respectively (Center for Climate Strategies, 2007).
EPA is promulgating new rules to address GHG emissions under the Clean Air Act permitting programs (EPA, 2010). Current requirements are focused on the nation's largest stationary source GHG emitters. New sources as well as existing sources with the potential to emit 90,718 metric tons [100,000 short tons] per year of CO_2e, will become subject to EPA PSD and Title V requirements. Modifications at existing facilities that increase GHG emissions by at least 68,039 metric tons [75,000 short tons] per year of CO_2e will also become subject to Title V requirements.

Center for Climate Strategies. "South Dakota Greenhouse Gas Inventory and Reference Case Projections 1990–2020." 2007. <http://www.climatestrategies.us/ewebeditpro/items/O25F18227.pdf> (21 December 2009).

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4.7.1.1.1 Construction Impacts

All phases of the proposed Dewey-Burdock ISR Project will produce greenhouse gas emissions. Table 2.1-6 presents the carbon dioxide emission estimates for the proposed action for each of the four phases and for the various source categories. The only greenhouse gas included in the emission estimates is carbon dioxide. NRC staff consider the exclusion of other greenhouse gases from the inventory acceptable because carbon dioxide is the primary greenhouse gas emitted by the proposed action (IML, 2013a) and the analysis in this SEIS is for disclosure purposes rather than a formal regulatory determination. SEIS Appendix C Section C3 contains additional information on the greenhouse gas emission estimates presented in Table 2.1-6. The estimated carbon dioxide emission level for the stationary sources is lower than the current EPA permitting threshold, as described in SEIS Section 3.7.2. In fact, both the peak year and construction phase emissions levels for all of the sources (i.e., facility, mobile, and electric consumption) are below this threshold. For comparison, the annual estimated greenhouse gas emissions for the peak year from all sources is 38,621 metric tons [42,572 short tons], which is a small fraction of those produced annually in South Dakota {36.5 million metric tons [40.2 million short tons] of gross CO_2e emissions} (Center for Climate Strategies, 2007). NRC staff conclusions concerning potential greenhouse gas impacts are addressed in SEIS Section 5.7 on air quality cumulative effects.

5.7.2 Global Climate Change and Greenhouse Gas Emissions

NRC staff determined that a meaningful approach to address the cumulative impacts of greenhouse gas emissions, including carbon dioxide, is to recognize that (i) such emissions contribute to climate change, (ii) climate change is best characterized as the result of numerous and varied sources, each of which might seem to make a relatively small addition to global atmospheric greenhouse gas (GHG) concentrations, (iii) carbon footprint is a relevant factor in evaluating potential impacts of an alternative, and (iv) analysis may include both the proposed action's contribution to atmospheric GHG levels and the potential effects of climate change to the proposed action. These concepts are more fully developed in Sutley (2010).

GHG emissions are described in SEIS Sections 2.1.1.1.6.1.1, 3.7.2, and 4.7. As described in SEIS Section 4.7.1.1.2, the operation phase emissions bound the other phases in terms of carbon dioxide levels generated. However, the peak year carbon dioxide annual emission estimate (when all four phases occur simultaneously) of 38,621 metric tons [42,572 short tons] represents the highest amount of emissions the proposed action will generate in any one project year (see Table 2.1-6). Electrical consumption is the source that generates the most emissions followed by mobile sources and then the stationary sources. The mobile sources include equipment associated with the drilling activity with the primary contributor being the drill rig (IML, 2013). As described throughout SEIS Section 4.7.1.2, NRC staff do not expect to see any appreciable difference in the overall greenhouse gas emission levels between the land disposal option and the deep well disposal option.

As described in SEIS Section 3.7.2, South Dakota accounted for approximately 36.5 million metric tons [40.2 short tons] of gross carbon dioxide equivalent (CO_2e) emissions in 2005 and forecast levels of 39.1 and 46.6 million metric tons [43.1 and 51.4 short tons] in 2010 and 2020, respectively (Center for Climate Strategies, 2007). The 2005 total is reduced to 34.9 million metric tons [38.5 short tons] as a result of annual sequestration (removal) due to forestry and other land uses (Center for Climate Strategies, 2007). The proposed Dewey-Burdock ISR Project peak year emission estimate of 38,621 metric tons [42,572 short tons] equates to less than 1 percent (0.11 percent) of the overall GHG emissions for South Dakota in 2005. The low level of GHG emissions from the proposed Dewey-Burdock Project relative to the state estimates provides the basis for the NRC staff conclusion that the proposed Dewey-Burdock ISR Project would have a SMALL incremental impact on air quality in terms of GHG emissions when added to the MODERATE cumulative impacts anticipated from other GHG emissions from past, present, and reasonably foreseeable future actions.

NRC also examined the potential effect of climate change on the proposed Dewey-Burdock ISR Project. While there is general agreement in the scientific community that some climate change is occurring, considerable uncertainty remains in the magnitude and direction of some of the changes, especially predicting trends in a specific geographic location. As described in SEIS Section 3.7.2, the recent report from the U.S. Global Change Research Program (GCRP) served as a source for climate change information (GCRP, 2009). From 1993 to 2008, the average temperature in the Great Plains increased by approximately 0.83 °C [1.5 °F] compared to the 1961 to 1979 baseline. South Dakota and the proposed Dewey-Burdock site are considered part of the Great Plains in this study. From 2010 to 2029, the average temperature in the Great Plains is projected to increase approximately 1.7 °C [3 °F] relative to the 1961 to 1979 baseline. Although GCRP did not incrementally forecast a change in precipitation by decade, it did project a change in spring precipitation from the baseline period (1961 to 1979) to the next century (2080 to 2099). For the region of South Dakota where the proposed Dewey-Burdock ISR Project would be located, GCRP forecasted a 10 to 15 percent increase in spring precipitation (GCRP, 2009).

Based on the previous analyses, the overall effect of projected climate change on the proposed Dewey-Burdock ISR Project is SMALL. The predicted increases in temperature and precipitation over the project lifespan are small. Much of the activity associated with ISR milling occurs below ground, whereas the listed climate change parameters are associated with the surficial and atmospheric environments. The predicted increase in precipitation and subsequent infiltration into the groundwater could result in an increase in recharge to the aquifer in the future. This could affect the proposed project by increasing the volume of groundwater in the

orebody and improving the effectiveness of the aquifer restoration process. Similarly, potential changes to the site environment and resources, such as ecology during the period when the proposed activities would be conducted, would not be sufficient to alter the environmental conditions at the proposed site in a manner that would change the magnitude of the environmental impacts from what has already been evaluated in this SEIS.

E5.8 Public Involvement

Another commenter requested that public meetings be held to discuss planning for extreme weather events, including stormwater management plans, due to global climate changes.

E5.23.4 Comments About Climate Change

Comment: 092-000012

The commenter requested that the SEIS discuss how the addition of the artificial bodies of water from the proposed Dewey-Burdock ISR Project relates to the effects of protracted unusual weather (e.g., too wet, too dry, too hot) associated with climate change on species that need water bodies. As an example, the commenter asks whether birds will adapt new migratory paths or take advantage of dependable artificial water bodies at the site if climate change creates a climate that dries up natural water bodies.

Response: *SEIS Section 3.7.2 characterizes expected changes in temperature and precipitation in the Great Plains due to climate change. Climate change impacts are typically considered on large scales (e.g., regional), and scientists recognize the need to refine the ability to project climate change at local scales (GCRP, 2009). Therefore, NRC staff acknowledge the difficulty in trying to specify precisely what the proposed project area would experience.*

As described in SEIS Section 2.1.1.1.2.4.1, the applicant proposes to build nine artificial ponds that will occupy a total of 2.75 ha [6.8 ac] in the Dewey area and a total of 3.36 ha [8.3 ac] in the Burdock area. However, SEIS Section 4.6.1.1.1 states that to reduce impacts to wildlife, the applicant will use fencing to restrict access to exposed ponds. Netting around the ponds to further restrict wildlife access is another mitigation measure that was suggested (see SEIS Section 1.7.3.7). The applicant is actively working on an avian monitoring and mitigation plan with FWS, SDDENR, and SDGFP that will be approved before construction activities begin and will be incorporated into the large-scale mining permit from SDDENR. The avian monitoring and mitigation plan will include mitigation measures to protect all birds. The SDDENR recommends that the large-scale mine permit include other wildlife protection mitigation measures to limit impacts to wildlife. These recommendations include fencing and/or mesh around the ponds, provisions to deter small and large animals, and avian deterrent systems (Powertech, 2012).

The description of the affected environment in SEIS Section 3.5.1 identifies the surface waters in and around the Dewey-Burdock area. Two main streams pass through the proposed project area: Beaver Creek (perennial) and Pass Creek (ephemeral). Pass Creek joins Beaver Creek southwest of the proposed project area. Approximately 4 km [2.5 mi] south of the confluence of Beaver and Pass Creeks, Beaver Creek flows into the Cheyenne River. Because of the implementation of controls to restrict wildlife access to the ponds (e.g., fencing) and the proximity of other surface water bodies in and around the proposed Dewey-Burdock Project site, any impacts on species reliant on surface water resulting from protracted unusual weather would be similar with or without the addition of the artificial ponds.

No change was made to the SEIS beyond the information provided in this response.

Comment: 128-000230

For the following reasons, the commenter disagrees with the draft SEIS statement on p. 5-41, lines 31–33 that the proposed Dewey-Burdock project will have a MODERATE incremental effect on climate and air quality when added to all other past, present, and reasonably foreseeable future actions in the study area:

- The specified text invites confusion because of the way in which it characterizes the concepts of incremental impacts (i.e., project impacts) and cumulative impacts together in the same sentence.
- The MODERATE incremental impact described in the specified text contradicts the ISR impact magnitude for non-greenhouse gases described in draft SEIS Section 4.7.1 (SMALL to MODERATE) and GEIS Section 4.4.6 (SMALL), as well as the ISR greenhouse gas impact magnitude specified in draft SEIS Section 5.7.2 (SMALL).

Response: *NRC staff acknowledge that the draft SEIS statement on p. 5-41 lines 31–33 should be revised to address concerns the commenter identified about clarity and consistency. Specifically, text in draft SEIS Section 5.7.1 was revised to*

- *Better distinguish the impact magnitudes associated with the proposed action and the cumulative impacts*
- *Better reflect the SMALL to MODERATE language for the non-greenhouse gas assessment expressed in draft SEIS Section 4.7.1*
- *Delete references to the greenhouse gas impact magnitude in draft SEIS Section 5.7.1 because greenhouse gas emission is addressed separately in draft SEIS Section 5.7.2*

NRC staff acknowledge that the non-greenhouse gas impact magnitude described in the draft SEIS (SMALL to MODERATE) varies from that described in the GEIS (SMALL). However, text in draft SEIS Section 4.7.1 already explains this difference. NRC staff concluded that the sitespecific conditions at the proposed Dewey-Burdock ISR Project are not bounded by the GEIS, because the emission and activity levels for the proposed Dewey-Burdock ISR Project are greater than those analyzed in the GEIS. NRC staff determined that the Dewey-Burdock impact assessment would be based on project-specific emission levels. Based on the site specific air modeling results, NRC staff concluded in the final SEIS Section 4.7.1 that, at times, the fugitive emission would result in a MODERATE impact on air quality, and the overall impact would range from SMALL to MODERATE. No change was made to the SEIS in response to this aspect of the comment.

As described in draft SEIS Section 5.7.1, the fugitive dust emissions and Air Quality Related Values were not included in the draft SEIS modeling results. Draft SEIS Section 4.7.1 identifies several aspects of the air impact analyses that have been updated in the final SEIS, including the incorporation of an updated fugitive dust emission inventory and Air Quality Related Values into the air dispersion modeling.